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CARNIVOROUS PLANT NEWSLETTER

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CARNIVOROUS PLANT NEWSLETTER

Official Journal of the
International Carnivorous
Plant Society

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Front cover: *Heliamphora minor* on Auyantepui, Venezuela. See article beginning on page 47.

The co-editors of CPN would like everyone to pay particular attention to the following policies regarding your dues to the ICPS.

All correspondence regarding dues, address changes and missing issues should be sent to ICPS c/o Fullerton Arboretum, CSUF, Fullerton, CA 92634. DO NOT SEND TO THE CO-EDITORS. Checks for subscription and reprints should be made payable to ICPS.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the co-editors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

Copy deadline for the September 1989 issue is July 1, 1989.

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NEWS & VIEWS

KEITH ALLEN, (715 S. 21st St., Harrisburg, PA 17194) . . .just thought that the CPN readership might be interested in knowing that pitcher plants play a minor, albeit significant, role in the movie *Mississippi Burning.*

At one point, several pitchers of what appears to be *S. flava* are visible in the background. They are identified in the dialog as Trumpet Pitchers.

Curiously, the actors then mistakenly identify a small white flower growing around the pitchers for the actual trumpets. Was the research for the movie that inadequate or did the director simply think that the white flowers were prettier than the real thing? Perhaps we should ask Orion Pictures.

Ed Note: I was called by someone connected with the picture in early March, 1988. He was looking for a source of Trumpet Pitcher flowers. Due to the early season shooting of the movie in Mississippi, I told him there would probably be no flowers available, but to be sure, he should check bogs near the Gulf Coast and/or call Bob Hanrahan of World Insectivorous Plants. Given what happened, I guess he didn't get any. (LCS)

ORGEL BRAMBLETT, (18950 SW 136th St., Miami, FL 33187) reports on last year's ICPS display at Fairchild Tropical Gardens.

Fairchild was dedicated in 1938 and is the largest tropical botanical garden in the United States. It is located near Miami and has a large assortment of outdoor natural tropical habitats, a greenhouse for rarer, more fastidious plants, and a complete botanical library and book store.

Each year in December, Fairchild has something called a "Ramble" which is kind of a botanical fair to attract visitors and realize funds through sales of plants, food, refreshments, etc. Along with Clyde Bramblett, Bruce Bednar and Don Keller assembled an educational display of CP in ICPS's name. The Ramble was 3-4 Dec 1988, and the CP included Sarracenias, Droseras, *Dionaea, Cephalotus,* Pinguiculas and Utricularias. Apparently some 80,000 people (Clyde says, "Give or take 40,000!") passed through the Garden those days.

We thank these three Florida ICPS members for representing our society at this event.

FAIRCHILD

RAMBLE

DAVID GUERRA, (4151 Adam Rd., Simi Valley, CA 93063). In 1971, when I was in Junior High School, I saw a Cobra Lily for the first time in a K-Mart store. I was awed by the diversity of nature to produce such a plant. To my surprise, after researching through the library on the subject of carnivorous plants, I found there were many more.

Although I made many inquiries on where to obtain various species of these plants. It was discouraging at first but slowly I managed to find people who shared my interest and today I have a very impressive collection. One year, my parents and I took a trip to Shasta National Forest to see *Darlingtonia* grow naturally. I weasled my way to locating them by telling the ranger that it was my research for a school project.

Since this time, I made inquiries to Australia and South Africa about *Byblis* and other exotic *Drosera* species. I could not find sources of seed nor information on how to collect them and this was depressing! I continued my collection while in school but it seemed that I was the only person interested in CP.

Now, praise all that is good because I found ICPS and other growers who share this mutual interest. What a fantastic goal of being a unique part of existence, a drop in the bucket, mind you, and to be a part of the continuation of this preservation effort.

DOROTHEA HUBER and **LORENZ BUTSCHI** (Allmendstr. 28, CH- 3014, Berne, Switzerland) have sent the following information on how they grow *Aldrovanda* outdoors year round in Berne.

They use a plastic sink about 60 cm. deep, after plugging off all holes. A 10 cm. layer of prewetted peat is placed in the bottom, into which is planted *Carex rostrata* (a species of sedge) in loose stands. The sink is sunk into the ground to the rim and filled with water. After allowing the sedge to grow some months and the little "pond" to equilibrate, it is innoculated with *Aldrovanda*. They have been using this method for years and it has worked well and requires no significant care.

We have often read about growing *Aldrovanda* with rice plants or in dilute aqueous extracts of plants of *Typha* (cattail) spp., but apparently the sedge works well as a companion plant also, supplying what is apparently an unknown substance(s) required for *Aldrovanda* growth. I wonder if anyone has tried ponds with live *Typha* or any other plants, perhaps even Utricularias.

RANDY LAMB (#106-5030 East Hastings St., Burnaby, British Columbia, Canada, V5B 1P6) I'm sure that quite a few CPN subscribers have a collection of National Geographics sitting at home getting a little dusty, so I though I would point out a few CP related articles and photographs just in case they missed or forgotten.

March 1987 *Mysteries of the Bog,* p. 397-420.
September 1981 *Nahanni: Canada's Wilderness Park,* p. 396-420.
September 1979 *Mosquitoes, The Mighty Killers,* p. 426-440.
January 1974 *The People of New Jersey's Pine Barrens*, p. 52-57
May 1964 *Malaysia's Giant Flowers and Insect-Trapping Plants,* p. 680-701.
May 1961 *Plants That Eat Insects*, p. 643-659.
November 1954 *In the Wilds of a City Parlor,* p. 645-672.

Once again I will be working for the summer as a biologist in Northern Canada, and my travels will be taking me into the CP habitats of Alaska, Northern British Columbia, and the Yukon Territories. I will be re-exploring locations of *Drosera angelica, D. rotundifolia, Pinguicula macroceras, P. villosa, Pl. vulgaris, Sarracenia purpurea, Utricularia intermedia, U. macrorhiza & U. minor.* If you need research material, herbarium sample, or slide/photos please let me know A.S.A.P. so that arrangements can be made.

ALEX MRKVICKA (Hopflergasse 6/16/1/4, A-1230, Vienna, Austria) sends news that the German edition of the magazine *Scientific American* has produced two 27 minute videocassettes called "Todesfallen" (roughly, "Deadly Traps") about CP and their victims. The photography is reported to be of top quality.

The cassettes are compatible with western European playback systems, but they can be ordered from Spektrum der Wissenschaft, Video Service, Moenchhofstr. 15, D- 6900 Heidelberg, West Germany. The price is about $60.00 US per cassette. We have no word on whether the narration is in German or English, and emphasize again that at present the cassettes seem compatible only with European playback systems.

Ed Note: *Scientific American* has a book publication arm in the US, WH Freeman Co., and perhaps they may sell the tapes in the future.

ERNEST TANIGUCHI (45-1040D Wailele Rd., Kaneohe, HI 96744-3153) One day while browsing at the University of Hawaii's library, I came across a book of interest. It was a copy of "Insectivorous Plants of Khasi and Jaintia Hills, Meghalaya, India (A Preliminary Survey) (1986). I did not recall ever seeing it included on the CP Books list in CPN. I managed to order a copy from the India government which took quite a while. Please find enclosed a review of this book along with a review of "Threatened Plants of India," (1980).

I will contact the Botanical Survey of India (the sources of these publications) to inquire of any further publications on CP of India. While on the subject of books, I came across two books that may be of interest to those wanting to know the meaning behind plant names. I'm sure many members have seen them already.

How Plants Get Their Names, by L.H. Bailey, first published in 1933 but republished in 1963 by Dover in Softback. It is still in print for $3.50 and should be available through most major book shops. The book first gives explanation of nomenclature, then presents two lists: one of generic names (genus), and one of specific names (species). The list of specific names contain translations of each Latin name. Both lists provide a general pronunciation key. This book should prove to be an indispensible bargain for amateur naturalists, amateur botanists, and anyone who is unfamiliar with Latin.

The other book is titled *Names of Plants,* by D. Gledhill and is similar to the aforementioned book. It is published by Cambridge press and available only in hardcover for $27.95, but unfortunately may be out-of-print.

On a different note, there was an interesting episode of Nova (PBS) "Skydive to the Rain Forest." this episode, filmed in 1985, concentrated on the exploration of a summit top in Venezuela. The documentary made mention of *Drosera, Utricularia* and *Heliamphora* among other non-CP growing in their natural habitat. But of particular interest is the mention of possible carnivorousness in *Brocchinia,* as also mentioned by J.A. Mazrimas (CPN 14:1) in his review of the Givnish, Burkhardt, Happel, and Weintraub article in the *American Naturalist.* It has been shown as a rerun on PBS.

A couple of years ago, there was an episode of Nature also on PBS, that was totally devoted to CP. It was titled "Death Traps." It will be available soon on video form, from Time-Life Video. I've been told that the price will be $19.99 plus $3.23 postage. Their customer service number is 1-800-621-7026.

Lastly, *Plants That Eat Animals,* by J.H. Prince, is currently out-of-print. I am interested in finding a copy, preferably new but also am willing to buy used. Please contact me of your price.

SPECIAL ANNOUNCEMENT

I am endeavoring to resurrect the "KWIC" computer system that was developed by Lynn Macey. This system allows the identificaiton of relevant literature based on keyword searches. In addition to the "KWIC" system, I will also be creating a database of ICPS member's interests and activities that can be used by other ICPS members to identify individuals of like interests or activities. This database could also be used to identify other ICPS members that live in the same geographical area.

In order to get these systems working, I need input from ICPS members. For the "KWIC" system I need title, author, publication and keywords for literature related to carnivorous plants. Also, a copy of the literature would be useful. For the ICPS members' information database, please send me a letter describing your interests, activities and phone number.

I hope to have these systems operational by the middle of 1989. When these systems are available, an announcement will be put in the CPN. ICPS members will then be able to send search requests to me. The price for a search will be set to cover the cost of the paper and postage. If there is sufficient interest, I could allow my computer system to be used as a bulletin board for part of the day.

Send correspondence to: Mark A. Lysne, 6901 Cedarbrooke Court, Falls Church VA 22042-3842.

THE GREAT SEED DEBATE—RESOLUTION!

by Donald Schnell

(Rt. 1, BOX 145C, Pulaski, VA, 24301, USA)

For more than a year there has been concern about the status of the CPN Seed Bank in the swirl of activities by the United States Endangered Species Act authorities (ESA) and CITES. Several individuals have written letters and enclosed copies of various interpretations of what was or was not acceptable. Until we were able to obtain a clear statement from the US Fish and Wildlife Service which administers ESA and CITES in this country (where the seed bank is based), we placed a seed bank exchange of certain species on hold.

Communication with the US Government was an adventure in itself. On 30 March 1988 I sent a letter to an individual in Fish and Wildlife whom I thought would be able to help us. That person replied in a letter dated 6 June 1988 that they were not able to help and that my letter had been forwarded to another individual who could. Not having heard anything by 3 July 1988, I sent a letter directly to this person. I heard nothing from either letter. Finally, on 26 March 1989, I decided to hit the telephone route and on 29 March 1989 was finally connected with Ms. Susan Lawrence. We had a very pleasant and informative conversation and my opinion of Ms. Lawrence as a result is that she is dedicated, sympathetic, very willing to help and believes in conservation completely.

Below is a synopsis of what is allowed regarding listed or endangered CP seed exchange as gathered by me during my telephone conversation with Ms. Susan Lawrence of the US Fish and Wildlife Service on 29 March 1989. I will divide the material into two sections: ESA and CITES. ESA would of course not apply directly to countries other than the US, but these countries may have their own endangered species program and CPN readers in these countries should be familiar with them. CITES applies to all participant countries on international exchanges only, excepting of course those countries which do not subscribe to CITES, and those participant countries who may have adopted CITES rules within their nations.

ESA—United States concerns—

Seed of all plant species—whether listed as protected under ESA, or in either of the appendices of CITES—may be sent interstate freely as long as ESA protected species seed is not being sold for profit or as barter. Seed of ESA protected species (eg *Sarracenia oreophila* or *S. rubra* ssp. *alabamensis*) must be specified as having been collected from propagated plants only. Ms. Lawrence did not feel that individual packet labeling was necessary, but that a policy statement by ICPS in the quarterly seed bank listing to this effect was sufficient. The seed bank packet fee which is charged for postage and materials cost is not regarded as sale or barter since no profit is obtained and ICPS is a non-profit society. There should be no concern about CITES rules interstate within the United States.

CITES—International Concerns—

ESA within the United States only applies insofar as anything mailed or shipped internationally must by definition cross State lines sometime. Therefore, only propagated seed of ESA protected material should be sent out of the US. The seed bank may send Appendix II list CP seed internationally without concern. *However,* seed of plants listed in Appendix I (the more endangered species of concern) ***must*** be accompanied by the usual permits.

Summation—

You may wish to keep the above material handy for reference if you intend using the CPN seed bank, either as a donor or to obtain seed. While this is Ms. Lawrence's interpretation as of the date of our conversation, official interpretations could of course change over time. Whatever feelings we as individuals have regarding the effectiveness of ESA or CITES, or lack of real effect, in protecting and conserving the plants we all love, it behooves us as ICPS members to follow rulings. Any ill feelings you have about ESA or CITES, or suggestions about changes, abolition or more stringent activities should be pursued through the channels of elected and appointed government personnel.

NEW CP CULTIVAR RECEIVED IN 1988

by James T. Robinson
1201 N. Race Ave., Arlington Heights, IL 60004

The following cultivar has been received during 1988 for publication in CPN:
Nepenthes (Daytona g.) 'Ron Determann'

Originated by Cliff Dodd, 2225 S. Atlantic Ave., Daytona Beach, FL 32018; received Aug. 25, 1988. Daytona grex resulted from crossing *Nepenthes ampullaria* X *Nepenthes alata*. 'Ron Determann' is the first selection from this cross which was made in summer 1984. While seedlings from the cross are typically lightly spotted, this cultivar is almost uniformly green. It largely resembles the seed parent, grows vigorously and produces many pitchers. Pitchers are larger than those of either parent and are accompanied by numerous short shoots. Stems are 1-1 1/2 cm. in diameter. Leaves are 28 cm. long, 6 cm. wide, med. green and slightly whitish-orange tomentose. Tendrils are 14-20 cm. long and similarly tomentose. Pitchers are smooth, 15 cm. tall, 8 cm. wide, with two frilled wings. Pitchers are light green outside and light red inside; mouth is oblique, 5-6 cm. in diameter. Peristome is 1 cm. broad, light green with inner and outer edges red. Lid is oval-shaped and green in color flushed with red. The spur is unbranched and 1-1 1/2 cm. long.

The cultivar is named for Ron Determann, Supervisor of the Dorothy Chapman Fuqua Conservatory, Atlanta Botanical Gardens. Vegetative propagations of this cultivar should be on display at the Atlanta Botanical Gardens in 1989.

Nepenthes (Daytona g.) 'Ron Determann'

DROSERA GIGANTEA

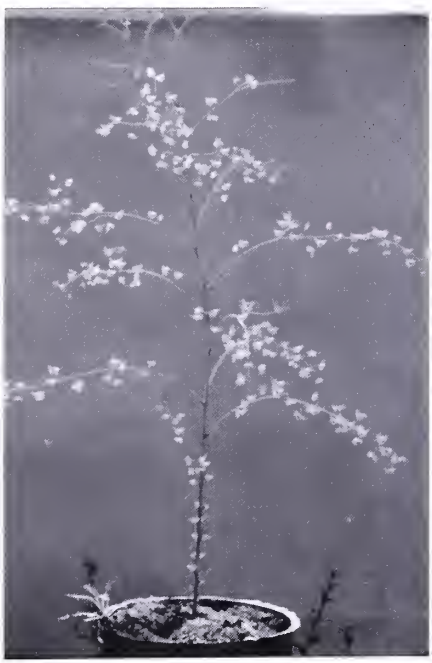
by J. Pietropaolo, P.A. Pietropaolo
Peter Pauls Nurseries

Most of the species of tuberous *Drosera* in Western Australia actually grow during the moist winter and then go into dormancy during the hot drier summer. In our book, "Carnivorous Plants of the World" we mentioned that we planted some species of tuberous sundews in soil that was maintained wet the year around to ascertain their survival under conditions which seem to be unlike those of their natural habitat. The tubers are found in nature at a depth of a meter or more. This zone is probably moist even though the surface zone is dry most of the summer, save an occasional shower.

The benches in our greenhouse are lined with plastic and the plants planted in plastic pots are set on the benches. Watering is achieved by placing about 2 inches of water in the plastic lining the benches. The water is allowed to evaporate. When the soil in the pots starts to dry out water is added to the benches.

The tubers were planted 6 inches deep in pots with a diameter of 8 inches in a mixture of one half peat and one half sand. At our latitude, 40 degrees 15 minutes North, the above ground growth becomes visible during January. The plant subsequently dies back during late July.

Sometimes the plants produce droppers, after or during flowering, which have achieved lengths of up to 5 inches. In photograph 1, one dropper can be seen on the left hand side of the plant. Photograph 2 shows a close up view of the dropper that has formed from the leaf. We have had as many as one dozen droppers on a single plant. They have never grown to ground level and exhibit very little if any tuber and eventually die back. If the leaves with the droppers are removed and planted the droppers will produce tubers. It appears that humidity may be a factor in dropper development because they develope when there are no pots beneath the branches of *D. gigantea* on the bench therefore increasing the humidity surrounding the plant.



Photograph #1

Photograph #2

A METHOD FOR COOLING A TERRARIUM

by David Guerra
4151 Adam Rd., Simi Valley, CA 93063

Using a common greenhouse technique, I have developed a way for terrarium growers (such as myself) to enjoy the benefits of sunlight while still maintaining an average temperature range of 85 degrees to 95 degrees F in most cases. I applied this method here in southern California using a south facing window. In the terrarium, I have species of *Nepenthes, Cephalotus, Darlingtonia, Heliamphora minor, Sarracenia* and *Drosera* growing in the temperature range stated above. The *Heliamphora* and *Nepenthes* (highland species) are grown in a separate, six-sided terrarium with the dimensions of 40 inches tall by 25 inches across, with a soil depth of 8 inches. The *Heliamphora* are growing in a separate pot of live sphagnum.

I constructed a miniature swamp cooler to accomodate both terrariums using only one thermostat. Basically, the swamp cooler is a five gallon Contico container into which I placed a submersible pump that remains on the bottom. About three inches from the bottom, I drilled two 1 5/8 inch holes parallel to each other on the bucket sides. Two sprinkler heads fit in the holes which spray a wettable fiber pad. Next, a 3 inch hole was made in the bucket lid and I taped an appliance fan in place. A vacuum cleaner hose was then attached to the fan output which led to the 1 1/2 inch pipe (PVC) that was placed into the top of each terrarium. I drilled 5/8 inch holes about 2 inches apart to allow cool air to reach the entire length of the terrariums. The pictures accompanying this article should clarify the above description.

Front view of set up with author.

Front view of bucket cooling system.

Cooling Part — see text for details.

Rear view of tank with air manifold at top.

BOOK REVIEWS

Insectivorous Plants of Khasi and Jaintia Hills
Meghalaya, India
(A preliminary Survey)

By J. Joseph and K.M.Joseph
Published by the Botanical Survey of India
Copyright by the Government of India, 1986

Reviewed by Ernest Taniguchi
45-1040D Wailele Rd., Kaneohe, HI 96744-3153

With what little information given, one will find that the Botanical Survey of India is indeed an organization of the government of India. This paperback book of 40 pages, is in actuality a "Preliminary survey, " of CP found in the state of Meghalaya, India. According to the director of the Botanical Survey of India, there is a total of 36 Indian CP species to report on record, 13 of which are found in the areas of Khasi and Jaintia Hills.

The 13 species discussed in this report are under the genera of *Nepenthes*, *Drosera*, and *Utricularia*.There is only one *Nepenthes* species that is found in this habitat, *N. khasiana*.

Two *Drosera* species are discussed: *D. burmannii* and *D. peltata* var. *lunata*. The bulk of the report is conducted on ten *Utricularia* species: *U. khasiana*, *U. stellaris*, *U. tayloriana*, *U. pubescens*, *U. stanfieldii*, *U. bifida*, *U. scandens*, *U. caerulea*, *U. striatula*, *U. furcellata*.

The introduction provides several important points of interest, one of which is conservation. Another point is the mention of disappearances of some species, and appearances of others , perhaps caused by occasional earth tremors.

The report provides keys to both genera and species with detailed description of the 13 species. There are no photos, with the exception of *N. khasiana* on the front cover. There are however, detailed line drawings like that of Francis E. Lloyd's "The Carnivorous Plants, " of each species mentioned. Overall, this book is organized in the fashion of "Plants of Prey," by Rica Erickson, description of habitat, plant anatomy, flowering, location, distribution, altitude and such. It is my opinion that though worthwhile, this book should mainly be recommended to CP enthusiasts who appreciate publications organized in such fashion.

The cost is $9.00 which includes postage for surface mail. There are some difficulties involved in obtaining this publication. First of all, correspondence with the Indian government is very slow. Secondly, the US Postal Service does not issue any International Money Orders for India. Therefore a money order drafted from a bank is necessary. Banks charge between $8.00 to $10.00 in service fees. This obviously does not make the book a fair value. The last alternative is to send cash, via registered and insured mail. It can be obtained from the address on page 44.

Please see **BOOK REVIEWS** on page 44.

WANT AD

Sigmund Schultz (5451 Palisade Ave., Riverdale N.Y. 10471, U.S.A.) *(WBT) Drosera leucoblasta, D. miniata, D. omissa, D. platystigma, D. pycnoblasta, D. scorpioides, D. Sewlliae*, other rare and unamed species, and any pygmy hybrids, *Pinguicula colimensis, P. corsica, P. heteropylla, P. macrophylla, P. oblongiloba, P. obtusiloba, P. orchidiodes, P. parvifolia*, other rare and unnamed species of Mexican and South American *Pinguicula, Utricularia quelchii, U. campbelliana, U. endresii, U. reniformis, U. humboldtii, U. praetermissa*, other rare tropical and epiphytic species, any *Genlisia*, and *Heliamphora*. *(TS) Drosera adelae, D. aliciae, D. binata dichotoma, D. capensis* (hybrid), *D. capillaris, D. dielsiana, D. filiformis filiformis, D. intermedia, D. natelensis, D. spathulata* (Kanto, Kansai, New Zealand), *D. x hybrida, D.* "Lake Badgerup", *D. nitidula, D. occidentalis, D paleacea, D. pulchella* (Pink), *P. lutea, U. longifolia, U. dichotoma, U. juncea, U. lateriflora, U. livida, U. monanthos, U. nephrophylla, U praelonga, U. pubescens, U. reticulata, U. sandersonii, U. tricolor, U. subulata*. I am interested in other species. I have assorted *Sarracenia* to trade, as well as other species to trade or sell.

BOOK REVIEWS (continued from page 43)

Threatened Plants of India
A State-of-the-Art Report

By S.K. Jain and A.R.K. Sastry
Published by Botanical Survey of India
Copyright by the Government of India, 1980

Reviewed by Ernest Taniguchi
45-1040D Wailele Rd., Kaneohe, HI 96744-3153

One of the many concerns shared over the years by ICPS members is the conservation of endangered CP species. Species are lost everyday, mainly by the causes of man. With this said, one can realize the importance of studies and reports such as this one.

The real threat to many rare plant species is the destruction of forests near developing villages and agricultural lands. It is the intent of this book to make inventory of rare and endangered species of Indian flora, many of which are endemic species.

Organized regionally and alphabetically, the study reports a total of 134 threatened species of which 4 are carnivorous. *Drosera burmannii, D indica, Nepenthes khasiana,* and *Aldrovanda vesiculosa.*

It is sad to learn that *D. burmanii* is "scarcely distributed;" *N. khasiana* "populations have dwindled due to excessive collections by traders and students of botany;" *Aldrovanda vesiculosa's* "habitat near Calcutta is threatened due to reclamation."

This 48 page softcover book contains only one color photo of CP: *N. khasiana.* Other photos are that of non-CP. This tiny book (more booklet than book) can only be recommended to those deeply interested in learning about the current (1980) situation with endangered plants (not only CP) in India. The cost is $5.00 postpaid (surface mail), and may be obtained from:

Director, Botanical Survey of India
P-8, Brabourne Road
Calcutta-700001
INDIA

SPECIAL ANNOUNCEMENT

What: San Francisco County Fair Flower Show
Salute To Flowers '89

When: August 25-27, 1989, 10:00 am—6:00 pm
Preview: Thursday, August 24
6:30 pm—8:30 pm

Where: County Fair Building (Formerly Hall of Flowers)
9th Avenue and Lincoln Way,
San Francisco, California

Info: All CPN'ers are welcome to enter.

THE *DROSERACEAE* DURING THE GLACIATIONS

John D. Degreef

6, rue Libotte B-4020 Liege (Belgium)

During the Pleistocene (after 5 MYA) the earth went through four glaciations with major consequences on the flora and fauna, especially in the Northern Hemisphere.

Of the *Droseraceae* of North America only a few plants of *Dionaea muscipula* ELLIS survived, from which the entire present population descends (Watson, 1978). At the maximum of the last glaciation, 18,000 years ago, South Carolina was the northernmost region with subtropical pine woods surrounded by narrow bands of cold temperate and deciduous tree forests (DELCOURT & DELCOURT, 1981). *Dionaea* probably maintained itself in a sheltered site of this area. In the other parts of the south the rivers carried the waters from the icy Northern plains, and moist habitats must have been too cold for *Dionaea*. Droughts may also have been a problem at times. The plant's root hairs are cutinized and thus impermeable. This renders them useless and they are considered to be vestigial (SMITH, 1931 p. 389). They must date from a drier period when a more extensive root system would have been necessary.

In Europe *Drosophyllum lusitancum* retreated towards Portugal and the regions on both sides of the Straits of Gibralter.

As to the genus *Aldrovanda*, it could only survive in the lakes, swamps and river deltas of southern Europe and U.S.S.R., as was already pointed out by KORZCHINSKY (1887). This author also showed that other tropical plants, known from fossils of the Tertiary, had done the same (*Marsilea quadrifolia* L., *Salvinia natans (L.) ALL., Trapa natans* L. and *Nelumbium caspicum* FISCH.). The delta of the Volga still harbours these species together with *Vallisneria spiralis* L. (VULF, 1936). During interglacial periods, *Aldrovanda* would reconquer its normal range. Fossil seeds have indeed been found in several central- and east European locations: -early Pleistocene interglacial from Yaman near Voronezh, 500 km South of Moscow, with *Salvinia* and *Brasenia* (NIKITIN, 1924)-in Galitzch, 400 km N.E. of Moscow, two different species of *Aldrovanda: A. vesiculosa* and *A. Eleonore* (DOKTUROWSKI, 1923 & 1930)-in a peaty swamp in the vicinity of Klinge near Kottbus, 100 km S.E. of Berlin (NEHRING, 1892)-from the last interglacial period, in Grodno on the Polish-Russian border, with *Trapa natans* L., *Stratiotes aloides* L. and *Caldesia parnassifolia* (BASSI) PARL (SZAFER, 1925).

The Southern Hemisphere was not as badly hit: the fresher temperatures, reduced evaporation and increased ground moisture which coincided with the glacial phases in the North, were rather favorable for *Drosera*. Parts of the deserts of Iran, the Sahara, South Africa and Australia would at times become green, with many large lakes and swamps (TERMIER & TERMIER, p. 337).

Due to the large quantities of water blocked in the ice caps, sea levels all over the world would go down (180 m at times!), letting shallow seas become dry land. Submerged Miocene and Pleistocene stream beds can still be seen north of Australia and New Guinea (*ibidem* , pp. 345, 358). The presence of laterite and kunkur nodules in the China Sea also proves the exposure to air in a rainy climate (WHITMORE, 1892 p. 669).

The two Americas had been separated since the late Cretacous. Continental drift finally brought them together so that *Drosera* from the south could repopulate the North American continent during interglacial periods. Some of the immigrants acquired a mechanism to resist the harsh winters: they formed hibernacula, tough dehydrated buds resistant to deep frost.

This allowed them to colonize other regions of the cold Northern Hemisphere. *D. rotundifolia* L. and *D. anglica* HUDS. are also found in Europe and in Asia, *D. intermedia* HAYNE in Europe. Seeds lifted into the high atmosphere during storms must have crossed the Atlantic. *D. anglica* was also blown to Hawaii, with the Asian dust which is a known component of the islands' soil. There the species lost the ability to produce hibernacula (MAZRIMAS, 1987)

In South Africa, climatic differences have created two distinct *Drosera* populations, one adapted to the summer monsoon in the north east, another to winter rains in the Cape region. Thus the two floras do not mix, although the species are similar. The Cape species *D. glabripes* (HARV.) SALTER, *D. hilaris* DHAM., *D. ramentacea* BURCH. resemble *D. madagascariensis* DC, *D. elongata* EXELL & LAUNDON and *D. bequaertii* TATON (DIELS, p. 99; SLACK, 1986 p. 48).

See **GLACIATIONS** on page 46.

GLACIATIONS continued from page 45.

By the way, the presence of *D. burkeana*, *D. madagascariensis*, *D. natalensis* and *D. indica* in Madagascar proves that a sea strait 400 km wide is not really an obstacle for *Drosera*.

During the Pleistocene the isolation of Australia finally ended when the 3,000 km gap which originally separated it from Asia closed. *Aldrovanda vesiculosa* could then enter Australia.

D. adelae, D. schizandra and *D. prolifera* remained in their Queensland forest. The latter must have fragmented during the glaciations, which explains the isolated ranges of the three species (LAVARACK, 1979). In the meantime the other member of section *Arachnopus (?), D. indica*, invaded the rest of Australia, New Guinea, Malaysia, Indochina, Japan, Southern China, Sri Lanka, India, and is now also found... in Africa! Its range there goes from Madagascar, Transvaal, southwest Africa, Mozambique, Angola to Niger, Burkina Fasso and Gambia (which is about as far west as someone can go). The intermediary sites in Pakistan, Iran, Arabia, Ethiopia and the Sahara have dried out since.

D. peltata is still found nowadays in Australia, Timor, the Philippines, Java, Japan, Thailand, Sri Lanka, India (and in New Zealand if *D. auriculata* is considered a subspecies). But a little known, very slightly mutated form described as *D. insolita*, was also found in 1911 in the heart of Africa, in Zaire's Shaba province (TATON, 1945).

The recent exchanges between Australia and New Zealand may appear puzzling but they are paralleled by other floral exchanges (AXELROD, 1975).

Two species, which because of their parentage are clearly Australian, have reached New Zealand. *D. pygmaea* is a close relative of the large section *Lamprolepis*,where its tetramere flower has paralles. *D. auriculata* is almost identical, if not a subspecies of *D. peltata*, another great traveller and a member of the important section *Ergaleium*.

One species from New Zealand which reached Australia and Tasmania is *D. arcturi* of section *Psychophila*. Because of the warm climate, it had to take to the mountains (HALLETT, 1984).

The only member of section Phycopsis, *D. binata*, also comes from Australia, where its more primitive subspecies, the so-called 'T-form' grows. This appears to be a diploid (2x = 32 D.N.A.). A horticultural form with four-pronged leaves, defined as "pedata" is a sterile quasi-triploid (3x = 46 -instead of 48!- D.N.A.) and may be a hybrid between the normal (tetraploid?) ssp ' *dichotoma*' and 'T-form' (KRESS, 1970). The culture of such variants labelled *D. binata 'dichotoma'* or *'multifida'* may have led to the belief that the natural subspecies needed to be cross-pollinated (MELLICHAMP, 1978). Intergrades between the 'T-form' and '*dichotoma*' are indeed mentioned (CLEMESHA, 1974; SLACK, 1979).

The 'T-form' is the most common in culture, but appears to be very rare in nature. It is only found in a limited area of the Blue Mountains near Sydney where it grows alongside the '*dichotoma*' ssp. (CLEMESHA, 1972 AND 1974) and presumably also on the southern coast, where LABILLARDIERE collected it in 1792. So it would seem that the diploid 'T-form' is yielding to the polyploid subspecies, i.e. the tropical '*multifida*' and the temperate '*dichotoma* '.

A species which is said to have come from New Zealand is *D. spatulata* LABILL. In this county it possesses 2n = 20 chromosomes. Australian plants and those from the Japanese Kanto and Yakushima regions have 40 (KONDO, 1976). In the Kansai district the number is 60 chromosomes. The rare plant from Kobayashi (with 50 chromosomes) is probably a cross with *D. rotundifolia*, a species from cold regions. This explains why the hybrid has been able to colonize this cooler part of Japan (KONDO, 1971) *D. spatulata* also grows in New Guinea, Borneo, the Philippines and Southern China.

Thus the simplest karotype is found in New Zealand, which leaves us with the problem: The only local representative of section *D. oblanceolata*, grows there (RUAN, 1981). It would seem plausible that *D. spatulata* migrated from there to many localities in the Far East, Australia and New Zealand, producing polyploids in the region with the most favourable climate, i.e. Japan. These stronger forms then eradicated the diploids, a process similar to the one suspected for *D. binata* 'T-form'.

What then would be the origin of the two Chinese species? Are they members of the preglacial flora of Asia, possibly descendants of the Miocene *Droserapollis* from Taiwan? Or are they Pleistocene immigrants from Europe of Africa?

A recent migration seems slightly more likely: *D. spatulata* still has a characteristic linking it with the other great travellers: In case of drought or cold winters the plant just dies, and only the seeds survive (CLEMESHA, 1974; BIRMINGHAM & COTTER, 1983). *D. burmanni, D. indica, D. capillaris*

See **GLACIATIONS** on page 52.

CARNIVOROUS PLANTS OF AUYANTEPUI IN VENEZUELA

Part 2

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Heliamphora minor on the Auyantepui is found so frequently that one has to take care not to walk on it. It grows in moist to wet peat, full sun to half-shade, and it can be found in dense colonies of more than 1 m². In protected places, the pitchers can reach a height of 20 cm. In addition to captured insects, *H. minor* is probably also nourished by the excrement of nocturnal frogs which hide during the day in the pitchers. I also watched a plunging spider which uses the pitchers for housing and as a food resource. The greenhouse cultivation of *H. minor* is rather simple. I plant them in course peat in plastic pots and make sure that they don't get too soggy. Only during sunny weather with sufficient air circulation do they get watered plentifully from above. That way the leaves can quickly dry to prevent rotting. From Spring to Fall, I fertilize them lightly once a month with Wuxal G. In suboptimal light levels, the lids develop very poorly. With temperatures between 17 and 30°C, my plants grow as nicely as in their natural habitat.

Brocchinia reducta belongs to a small group of plants which grow as well in the lowland savannah as on the plateau of the Tepuis. In the foothills, I found them in dense colonies in open swamps. On the plateau where the climate is regularly humid, the species grows in loose sand or peat layers and sometimes it even roots in its own leaf detritus on bare rock. Individuals of the lower sites mostly contain amazing numbers of insect carcasses. Higher up, I found less prey in the cylindrical rosettes, probably because fewer insects are living in higher altitudes. On the Tepui, the plants are more often inhabited by small frogs, spiders and snails which contribute to the nourishment of the plant. Though the flowers of *B. reducta* are not bird flowers, I often watched *Colibris* nibbling on them. Since *B. reducta* can colonize different habitats, cultivation is not very difficult. The most important factor is full and direct sunlight all day long. If light levels are insufficient, the leaves will turn green and spread apart. In culture, the plant will also survive with lesser light, but its overall appearance would not look like the natural *B. reducta* since it is always exposed to direct sunlight. Without fertilizer, *B. reducta* grows very slowly. If it gets enough nutrients, one can almost watch it growing. I cultivate my plants in clay pots in a peat-sand mix, 5:1, which I keep regularly slightly moist. In summer they stand outdoors with temperatures from 18 to 35°C and in winter I give as much light as possible with temperatures between 17 and 22°C.

Catopsis berterioniana. I found this Bromeliad at the foot of Auyantepui at an elevation of about 1000m. I was not able to determine this species properly, but I noticed immediatly that carnivory is involved for the following reasons:This epiphytic species grows in open shrub vegetation which produces very few deciduous leaves. Various species of *Aechmea*, *Guzmania*, and *Tillandsia* which grow in a few meters vicinity in a forest, fed by dead leaves, cannot grow with *C. berteroniana*. However, I found in the mentioned stands of *C. berterioniana* 5 different *Tillandsia* species which are all visually camouflaged and which are all inhabitated by ants. Four of them show characteristics of myrmecophile *Tillandsias*. It has been proven that myrmecophile *Tillandsias* profit by the detritus brought in by the ants. In contrast to these *Tillandsias*, the light yellowish leaves of *C. berteroniana*, of which the lower parts are covered with large amounts of white wax-powder, are conspicuous to the observer from a distance.

See **VENEZUELA** on page 51. Photos on pages 48-50.

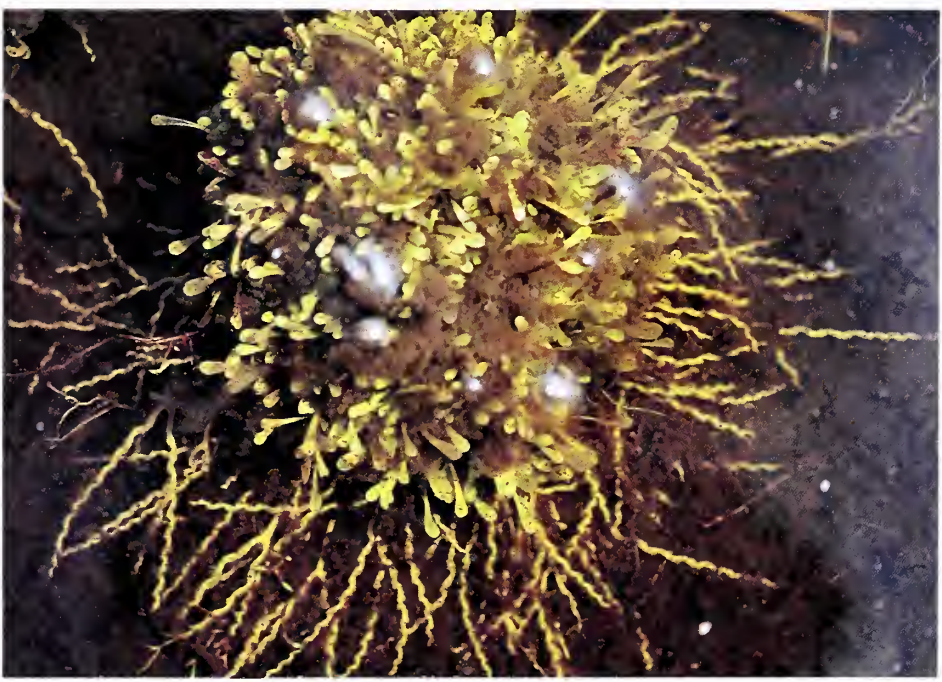
Utricularia humboldtii growing in *Brocchinia tatei*.

Heliamphora minor

Prey in two leaves of *Catopsis berteroniana*.

Prey in the tubes of *Brocchinia reducta*.

Unidentified *Drosera* sp, growing in dry sand on Auyantepui.



Genlisea roraimensis, growing just below the water-surface on Auyantepui.

VENEZUELA continued from page 47.

In the remarkable book by V. Vareschi which is titled "Vegetationsokologie der Tropen", a *C. berterioniana,* erroneously under the name *Cottendorfia*, sits on a branch under an open sky. Typically, he uses this picture as an example of a plant in which the roots act only as fixing organs, while the leaf-rosette is responsible for the nourishment. How is this possible? If you open up a rosette, you get a clear answer shown in the photo.

Later, I found in a German paper, "Die Bromelie" 4/1986, in connection with a useless and theoretical discussion about *Brocchinia reducta* and whether it is carnivorous or non-carnivorous (E. Schott, Stellungnahme zu:Karnivorie der *B. reducta*), an interesting reference about a dissertation by D. Fish. He among other things dealt with the newly discovered carnivory of *Catopsis berteroniana.* (D. Fish, 1976:...discovery of an insectivorus bromeliad: Ph.D. diss. University of Florida, Gainesville.)

The cultivation of *C. berteroniana* is the same as the one for *Tillandsia* to which it is closely related. It needs a well ventilated place with much light and high temperature. even in half shade it retains its vase-shape. Within a year the roots will fully develop, adhering to coconut shells cut in half or to pieces of corkbark.

Most of the species discussed in this report are offered for sale or for an exchange of plants on the basis of equivalent rarity only. A free price-list is available from:

Dorothea Huber,
Allmendstr.28,
CH-3014
Bern, SWITZERLAND

We cannot mail any *Genlisea* or *Utricularia* species to countries which only permit import of plants that are free of soil (for example, the U.S.A.)

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GLACIATIONS continued from page 46.

and *D. brevifolia* behave similarly. *D. oblanceolata* have come from Africa? It is certain that *D. indica* and *D. peltata* managed to make the same trip in reverse. *D. burmanni* may have started its jouney in Africa also, later to die out there.

The naphtoquinone of *D. spatulata* is said to be 7-methyljuglone. This indeed is the same substance as in all African species tested: *D. aliciae, D. burkeana, D. capensis, D. cistiflora, D. cuneifolia, D. madagascariensis, D. trinervia.* With the exception of *D. (filiformis) tracyi* and *D. hamiltonii,* the *Drosera* in other parts of the world contain plumbagin instead (ZENK *et al.,* 1969).

Yet the matter is not so simple. The *D. spatulata* may have been the wrongly labelled and very common horticultural form which in reality is *D. aliciae* (KRESS, 1970). Secondly, 7-methyljuglone may be more common in non-African species than generally assumed: in *D. rotundifolia* for example, the dominant naphtoquinone is not plumbagin (as ZENK and his colleagues thought), but methyljuglone (BENDZ & LINDBERG, 1970; BONNET *et al.,* 1984). On the other hand, the African *D. congolana* TATON unexpectedly contains plumbagin (BOUQUET,1970). More research is obviously needed!

The geographic isolation of *D. spatulata* 'New Zealand' has allowed for some evolutionary divergence from the other forms. The sepals have become different already (KRESS, 1970), a striking parallel to the situation in the *D. peltata—D. auriculata—D. insolita* complex.

D. pygmaea, D. binata, D. arcturi and *D. spatulata* were able to cross the large body of water between Australia and New Zealand thanks to the very low sea levels during the glaciations. These allowed parts of what is now the Norfolk Rise and other submarine plateaus to emerge (TERMIER & TERMIER, p. 351). The *Drosera* could then hop from island to island as they did between Africa and Madagascar. This also explains the presence of the North Australian *D. indica, D. petiolaris, D. peltata, D. banksii* (and also *Byblis liniflora*) in New Guinea (CONN, 1980; VAN STEENIS, 1968).

All the data presented here more or less explain the modern distribution of the Droseraceae.

Aldrovanda has taken advantage of the warm 'Atlantic' climatic phase to reconquer its very large range, even if it is now suffering from the more recent cooler conditions and from human activities (BERTA). *A. vesiculosa* L. is the only surviving species, even in Africa. This continent and Australia must therefore have been colonized recently, otherwise some of the other species would have remained there. Only a few of the many localities in Saharan and south African lakes remain: three in Ghana, four in Tchad, two in Sudan (?) and a few others in Cameroon, Tanzania, Zambia, Moazmbique and Botswana (LEBRUN, 1968 & 1969; BERTA, p. 568; LLOYD, p. 195; JACOBS, 1981).

Sad to say but *Dionaea muscipula* and *Drosophyllum lusitanicum* seem doomed, at least on a geological time scale, and considering the hundreds of glaciations to come. . .

The flora of North America has received *D. brevifolia* and *D. capillaris,* which behave as annuals because they have not had time to develop hibernating mechanisms. Their range has become discontinuous between the Gulf Coast and South America, due to increasing aridity. *D. panamensis* is a close relative of *D. brevifolia* (CORREA & TAYLOR, 1976 p. 390) and links the two now widely dissociated parts of this species' range (the U.S.A. and Southern Brazil plus Uruguay).

It will come as no surprise that a Chilean *D. uniflora* from about 10,000 years ago (HEUSSER, 1982) and a Pleistocene *D. rotundifolia* from Don Valley, Canada (PENHALLOW, 1900) were identical with the modern species.

The Cuban and South American forms of *D. intermedia* may have migrated from North America at a time when sea levels were low. They have lost the ability to form hibernacula.

In the Mediterranean, *D. rotundifolia* has been left stranded in several highland locations in Spain, Corsica, Italy and even the Lebanon (DIELS, pp. 94-95) when the cool temperate climate moved northwards 12,000 years ago. The subspecies 'bracteata' from the mountains of New Guinea (CONN, 1980) must be a similar case. During the glaciations the tropical forest would fragment into woody patches separated by season forest and savanna. The latter would sustain *D. rotundifolia*, especially in the sphagnum swamps of the colder, mountainous parts.

In Australia the distribution of *Drosera* followed the shifting climatic zones. In the southern half of the continent the subgenus Ergaleium and the pygmies of sections Lamprolepis and Rorella had already developed their specific defenses against droughts (tubers or gemmae), when increasing aridity displaced their range towards the south and divided it into two areas which hardly have had contacts since.

The southwest has a Mediterranean climate, with winter rains. This leaves the plants exposed to a dry and hot summer. Many genera were not able to cope with such conditions, but the *Drosera* could.

The lack of competition allowed their developing into numerous species. As with other local plant families, almost none of these are today found outside this area. Not a single pygmy *Drosera* from section Lamproepis exists outside W. Australia. *D. macrantha* is the only southwestern species of its section to have made it to east Australia, where it has had time to evolve into a distinct subspecies *'planchonii'*.

In the same region still grow the descendants of the primitive tuberous and pygmy populations: *D. peltata* and *D. auriculata* from section Ergaleium, *D. whittakeri* from section Erythrorrhiza and the mutated dwarf *D. pygmaea*. The conditions are better here, as the climate is somewhat intermediate between the southwestern one with rainy winters and the summer monsoons in the north. The local *Drosera* had to cope with a lot of competition, and not as many species have evolved here as in the west. The same goes for section Phycopsis (*D. binata*). During the colder rainy periods, these eastern populations would extend to the North (and from there to New Zealand). The immigrant *D. arcturi* would be able to live in the mountains, from Queensland to Tasmania, retreating towards the south in drier periods such as at present.

With increasing rainfall, the boundary of the northern grassy savanna with its *Eucalyptus* woods would move southwards. The present ranges of *D. burmanni, D. petiolaris* and especially *D. indica* demonstrate how far this movement went (see maps 14, 13 and 27 in MARCHANT & GEORGE).

The range of the southwest species may have extended to the drier areas around the many lakes and rivers (now almost dried up) of central Australia. Two species of section Ergaleium also immigrated into the North, and lost their tuber: *D. banksii* R. BR. and *D. subtilis* MARCHANT.

Two eastern species have managed to establish bridgeheads in the southwest: *D. peltata* and *D. pygmaea*.

D. glanduligera (section Coelophylla) seems to have reached east Australia too late to be able to colonize New Zealand (DIELS, p. 47).

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NEXT: Early History of *Drosera* and *Drosophyllum*.

SPECIAL LITERATURE REVIEW

by Donald Schnell

(Rt. 1, Box 145C, Pulaski, VA 24301, USA)

Juniper, BE, RJ Robins and DM Joel. 1989. *The Carnivorous Plants.* Academic Press. 353 P. $150.00 US.

This book has been long awaited ever since word went out that the authors were working on a comprehensive book publication covering the anatomy, physiology and syndrome of carnivorous plants. The last such work was by Francis Lloyd in 1942, a book which is held in affection by all of us interested in CP.

As the authors indicate in their preface, the work is not intended to supplant Lloyd, or even Darwin's 1875 book for that matter, but to supplement them. I would concur in this result and recommend that all serious students of CP consult Lloyd, at least, as well as this new volume.

Academic Press has thankfully put aside the gaudily printed boards of their recent books (also used by many other textbook publishers) and we have a real jacket once again. It is colorful, and is the only color in the volume. Readers should understand that this book is not intended to discuss taxonomic treatments, cutivation or to provide color photo pictures of plants. All diagrams, photos and line drawings are in black and white, which is quite satisfactory since most of the photowork is of anatomic microsections and transmissiona and scanning electron microscopy.

The book is oversize, measuring 22.5 x 28.5 cm, and the text is printed in two 9cm wide columns per page. Typeface is large and quite readable. Binding is of moderate quality (the boards of my copy came warped), and while the paper is not fully glazed, it is moderately heavy and reproduces the photowork well. As noted above, there are 353 pages, but 309 pages are actual text, the rest being references, index, appendices, etc. There are 26.5 pages of references for a total number of approximately 1160 citations listed. References are as current as the late 1980's. More on these in a moment. There are 174 figures, mostly of the description above. These are supplemented by tables where required.

The authors certainly have their credentials in the area that is covered in most detail and best in the book: New concepts of anatomy, physiology and biochemistry related to the carnivorphyte syndrome. While the numbers of references is impressive, there are curious gaps in certain areas where they might as well have completed a particular author's CP bibliography, which would not have been excessive in any case and would have been pertinent. A serious reader will often go to a book of this kind not only to review the author's summaries and ideas, but as a source for references. One should still use other sources as well, particularly Lloyd, CPN Literature Reviews and the standard specialty library indices.

In Chapter 1, there are three of the more interesting tables and figures. One is a radial representation of the carnivorous syndrome among the genera. Another is an update of the expected list of total numbers of species in the accepted genera of CP and their distribution. This has been adapted from the CPN World List of 1986 by Schlauer. The authors state they will use this nomenclature throughout the book, but there are confusing lapses. There is also a chart showing taxonomic and nomenclatural authorities in roughly sequential time, this again acknowledged from Schlauer. Unfortunately, again, the book authors did not use Schlauer's complete bibliography; the missing entries would have found sufficient space in the chart.

The book begins with a preface, and a brief glossary of the origin of the CP generic names. This is followed by a key to abbreviations used in the book. the design of the remainder of the book is entirely different from Lloyd who organized his work into chapters for each genus which was covered as completely as knowledge permitted in 1942. The present authors have divided their book into sections and chapters based on specific features of the carnivorous plant syndrome. In most chapters, there tends to be a laundry list of genera and features that apply to the subject of that chapter. The aim of the authors is somewhat different from Lloyd; that is to present a cohesive discussion of each feature of the CP syndrome referred secondarily to the genera. They have succeeded except for a few annoying side effects of such an organization: If one wishes only to read about a certain genus, the readers must consult nearly all chapters rather than one. Also, valuable space is taken up in most chapters by redescribing the genus again and again. It is as though each chpater was written freestanding of the others, although there is abundant cross-referencing to other chapters and pages to support arguments.

The main text is divided into six parts, each with three (one with four) chapters. Part 1 is an introduction to the CP syndrome and plant habitats. The authors early on establish a six-point criteria for what is truly a carnivorous plant, and pretty much stick with it throughout the book, although occasionally there is some muddiness possibly related to multiple authorship or time lapse in writing such a detailed work. Part 2 covers attraction and trapping, and is probably the second best section in the book. The best—certainly related to the authors' primary interests—is part 3 on nutrition and digestion. This section of four chapters brings one thoroughly up to date after Lloyd. Part 4 covers phytochemicals and their roles in carnivory, and in herbal and medicinal uses. Part 5 is on exploitation and mutualism. The chapters on associated fauna and pollination and reproductive strategies are the most interesting and potentially most useful but suffer from lack of completeness and detail. The chapter on mimicry vs. mutualism is best described as tedious. Finally, part 6 covers some aspects of evolution, both past and with future comments. There is discussion of features of the CP syndrome in non-CP (eg the glandular sticky stems of *Silene* ssp), which purpose is to put into perspective how the CP syndrome may have evolved as polyphyletic lines of aggregations of these features.

The two appendices are interesting but I am not certain why they were selected over any other material available. The first is a summary by Frank Morton Jones of letters sent by Rebecca Austin back east and describing her observations of *Darlingtonia* in the field in the 1870's. The second is a 1987 field note by Matthew Jebb concerning some observations of the natural history of *Nepenthes* in Papua.

Overall, the book is written in very clear language and is easy to follow and understand, although the reader will have to be current with some technical aspects of botany, ecology and plant physiology in general to get through some sections. I found very few typographic errors considering the length of the text, most being misspellings and an occasional jumbled sentence (eg one which compares *Drosera* to *Drosera* generically).

Unfortunately there are several errors of substance and omission, particularly in areas where the authors look into field botany, ecology, evolutions and plain "natural history". I will mention a few examples.

Kevan is listed once among the references, but none of his papers of the late 1970's are quoted. In these he seriously questioned—with good evidence—the interpretation of UV light path markings, and how insects perceive color according to our concepts. Yet, the authors of this book show some nice photos through UV filters of various trap leaves and innocently go along the standard UV path without any acknowledgement or discussion of other possible meanings to what we see and photograph.

Dionaea is described as having wider, flatter petiolar blades in the late summer and autumn and narrow blades in spring, when in fact just the opposite is the rule both in field and well-grown green house plants. The authors state as an important prop in several of their evolutionary and ecological proposals that all carnivorous plants are insect pollinated, period. They seem to have overlooked cases of cleistogamous flowers in utricularias where abundant seed is produced, and chasmogamous flowers of the genus for that matter where insect pollination has yet to be clarified. Also, many droseras are autogamous if their flowers are not externally pollinated during the day or so most are open.

Again, in the pollination chapter, only two references are quoted repeatedly in the very short section for sarracenias. The authors conclude that the pollination mechanism for these pitcher plants has not been determined, as well they might limiting themselves to the two references. Actually, two very complete studies on pollination syndromes of sarracenias were available in plenty of time for use by the authors of this book. One on *S. purpurea* in New England was completed in 1979, and another on *S. flava* in North Carolina in 1983. Both of these studies contain many additional references that would have stood Juniper et al. in good stead had they sought them out. This is a prime example of reference limitation (see above) causing problems with complete assays of a particular subject before conclusions are drawn.

In another area concerning pitcher plant fauna associates, no mention is made of the leafcutter wasp which is found quite easily and relatively commonly in the larger, more erect *Sarracenia* pitcher species. The wasp is interesting in that it packs a freshly opened pitcher with alternating layers of grass or dried sphagnum and larval chambers. A single egg is laid in each larval chamber and a stung insect such as a cricket is added to each chamber for larval feeding. Jones reported this wasp first in the early 1900's. I have not seen paper wasps as described by Juniper et al.

Finally, in areas in which I am particularly familiar with the literature, I noted that several authors of papers were directly misquoted regarding their own conclusions from their studies. This should alert one to not use this book as a secondary citation source but to check all original references if possible before quoting them.

In summary, I can recommend this book as an addition to the rather scant carnivorous plant book literature, with the caveats mentioned above. The authors do bring forth some new material (even older references missed by Lloyd) and some stimulating discussion and concepts. However, the work is not encyclopedic as many might hope it would be.

Which brings us down to one last point—The price. At $150.00 US, the book will clearly see a limited market, largely libraries or large academic departments with adequate book allowances. We all have been aware of a steady inflation in book prices over the years, but it has been my impression that in the past three or four years there has been a veritable explosion in pricing of all technical books beyond what we see in their production value in hand. I would suppose that Academic Press realized that even though this book was needed that it would still have a very limited appeal and did not wish to take a loss on it that would have to be made up in sales of other books.

WANT AD

Rob Maharajh (168 Dalewood Ave. South, Hamilton, Ontario, Canada, L8S 1Z4) "WTB: Fresh seed, plants or gemnae of *Drosera cistiflora* varieties, *Drosera esmeraldae*, *Drosera pauciflora* varieties, *Drosera neocaledonica*, *Drosera ramantacea*, *Drosera sessiliflora*, *Nepenthes pectinata*, *Nepenthes macfarlanea*, *Nepenthes rajah*, *Nepenthes villosa*, *Pinguicula grandiflora* any varity, *Pinguicula longifolia* any variety,*Pinguicula vallisneriifolia*, *Pinguicula pumila*, *Pinguicula lusitanicum*, *Pinguicula agnata*. Any tuberous *Drosera* and Mexican Pings. and/or hybrids beside *Pinguicula caudata*."

"TS: *Drosera linearis*hibernicula and seed, *Drosera spathulata* varieties,*Drosera adelae*, *Drosera trinervia*, *Drosera prolifera*, *Drosera dielsiana*, *Drosera pulchella*, *Drosera natalensis*, *Drosera burkeana*, *Pinguicula vulgaris* hibernicula, *Utricularia longifolia*, *Byblis liniflora* and many others. I would like to contact CP enthusiasts from around the world."

COMING IN SEPTEMBER

- Herbarium samples of CP
- Australia's Diminutive jewels; the Pygmy Sundews

In the December issue:

- New ICPS Directory and 1989 Members

CEPHALOT
FOLLICULARIS
CEPHALOT
FOLLICULARIS

TAKE 2

See December, 1988 CPN. The slides have been reversed. See any difference? Write your reaction to Joe Mazrimas.

LITERATURE REVIEW

Folkerts, George W. and John D. Freeman. 1989. *Pinguicula lutea* Walt., F. *alba*, f. nov. (Letibulariaceae), a white-flowered form of the yellow butterwort. Casanea 54:40-42.

A white-flowered form of this usually yellow species was discovered in Liberty County, Florida north of Wilma. It grows among the yellow-flowered forms and is relatively rare, followup visits from 1981-1986 disclosing from 2 to 7 plants in the area. The variant has been designated f. *alba*. (DES)

Gardner, Rob, 1989. Growing native carnivorous plants at home. NC Wild Flower Preservation Soc. Newsletter 1:4-7.

This article knowledgably covers culivation of *Dionaea* and Sarracenias as the most popular CP of interest. The author has had great success with these plants at the NC Botanical Garden in Chapel Hill. The author recommends the basic brown peat moss medium with either vermiculite, sand or perlite added, the plants potted up in plastic pots set in at least one inch of water. He advocates a light fertilization (1/4 label strength or less) monthly during the growing season only. Instructions are given for germinating seed. The article also contains five excellent line drawings of Sarracenias by Dot Wilbur, plus a cover drawing of *S. leucophylla*. The final prize is a small packet of *Sarracenia* seed taped into the issue for the reader to try his or her hand. (DES)

George, Uwe. 1989. Venezuela's Island in Time. National Geographic Magazine, 175:526-561.

There seems to be a surfeit of information on the Venezuelan tepui lately. PBS TV in this country has had two one hour programs this past year, we have our two issue series going in CPN, and now National Geographic has this excellent article. Actually, some of us can never get enough of the tepui, we get "tepui fever" as described in the article and require more information and begin to seriously consider traveling down there.

This article is in the usual inimitable, excellent Geographic style and is very well written. The author spends most time on Mt. Roraima, but also much time on Auyan- tepui and he even visited the meteorogically forbidding Aparaman-tepui. There are the expected diagrammatic maps of how the tepui formed, beginning before the separation of Africa and South America. The aerial photos are superb as are the photos of inhabitants of tepui. Our CP are represented by *Drosera roraimae, Heliamphora tatei* and *Brocchinia reducta*. The ecology and geography of the area is well illustrated, as is the author's adventures in getting to and from the tepui over several years' travel. The drenching daily and nightly rains with lightning and thunderbursts lasting a full minute are described. The climbs up faults in nearly sheer walls, the veil-like waterfalls coming off nearly all the tepui, all are here. If you can get a copy of this issue (May, 1989), it will be well worth the trouble. (DES)

PBS Television (USA), "Islands in the Mist", NATURE (Series Name), 16 April 1989 (Most local stations).

You may wonder what a review of a TV program is doing in the Literature Review section, but it seems a good place to put it. In the USA, most non-commercial quality TV is on the Public Broadcasting System (PBS), and one generally good series is called NATURE, which is on weekly. NATURE owes a great deal the BBC and the Oxford Films from whom it obtains most of its programming, usually with the narration by George Paige, the series editor.

In this case, we have a film by Wolfgang Bayer concerning the tepui of Venezuela. Unlike the silliness of the program of about a year ago (*not* the NATURE series) that featured skydivers pretending to be serious about their sport being the only way to land on the tepui, and during which there were serious injuries and an evenutal pickup by helicopter, and during which we took in the fauna and flora as mainly background to the adventuresome goings-on (They trampled about over hectares of brocchinias, and even cut them up to make a long pipe for a show), THIS program is truly serious. The first half concentrates on the tepui themselves with superb aerial photography and fine shots of various geologic and biologic aspects shown on purpose. Various specialist expeditions are described. Most time is spent on Mt. Roraima and Auyan- tepui. CP shown include *Brocchinia reducta*, several droseras and one *Heliamphora* in several views, including flower.

The second half of the program drifts, but is of some importance. It shifts to the Gran Sabana in which the tepui are located, the almost endless tropical lowland forests. The film maker points out how the Gran Sabana is being destroyed by deforestation (through burning) for agriculture. It is from the sabana that moisture rises daily to condense into thunderstorms over the tepui to give 150 inches per year of needed rain to retain the unique ecosystems and species.

Watch for this one in reruns and tape it for your collection.

Janartham, M.K. & A.N. Henry, A new *Utricularia* L. from Keraia, India. Bull. Bot. Surv. India 28(1-4): 195-197 1986.

A new species *U. nayarii* is described by the authors.

Takahashi, H., Ontogenetic development of pollen tetrads of *Drosera capensis* L. Bot. Gaz. 149(3): 275-282. 1988.

Using electron microscopy, the author found a proximal central pore which is regarded as a newly evolved structure in an ancestral type of *Drosera* pollen tetrad. There are 10-15 channels which are homologous to the ancestal apertures. A discussion how these structures relate to self-fertilization was also presented.

Vassilyev, A.E. & L.E. Muravnik, The ultrastructure of the digestive glands in *Pinguicula vulgaris* L. relative to their function: I The changes during maturation. Ann. Bot (Lond.) 62(4): 329-342 1988.

Digestive glands are fully mature while the leaf is in the bud stage. All the gland cells remain on the fully opened leaf. The authors traced the origin of the digestive enzymes from the site of synthesis in the RER to the storage site in a special layer of cells associated with the slime layer and vacuoles.

Vassilyev, A.E. & L.E. Muravnik, The ultrastructure of the digestive glands in *Pinguicula vulgaris* L. relative to their function: II The changes on stimulation. Ann. Bot. (Lond.) 62(4): 343-352 1988.

During prey digestion and absorption of nutrients, the secretory cells of the digestive glands remain highly active. A model similar to that suggested for *Dionaea m.* is proposed. After the cycle of digestion and absorption, destructive processes are initiated in the glands which is similar to what happens in an aging and unstimulated leaf.

(Various authors on bogs in Ireland). 1987. Ireland of the welcomes, 36(3), May-June.

This issue of IRELAND OF THE WELCOMES, a magazine put out by the Irish Tourist Board, is devoted entirely to bogs. The subject is pretty well covered in ten articles by various authors and in photos and artwork. The articles range from natural history and scientific, to bogs in art and letters.

To mention a few of the articles, the issue begins with a very nice and clear explanation of the kinds and origins of bogs in Ireland. A very great portion (one-seventh) of the landmass was covered in bog which has played a significant role in Irish culture and history. The thick, red-brown, luxuriant domed sheet bogs of years ago would occasionally shift (bog bursts) and cover roads, forests and unfortunately people similar to a landslide in speed and cataclysmic results. A nice photo of *Sarracenia purpurea* illustrates mention of successful introduction of the species in 1909 and it has since proliferated. There are eleven species of CP in Irish boglands.

There is an interesting article on the archaeology of bogs, including some of the artifacts found (gold and bronze survived better than iron) and even of bodies of people, apparently placed in the bogs for burial).

An article on economic uses of bogs mentions how peat harvesting has kept the Irish fairly energy dependent for years. The dried peat is a major fuel source when used as briquets or as dust. There are details about the tools and methods for hand harvesting (still used by individuals) and the massively efficient machinery used by companies.

A final article on conservation mentions that the bogs are disappearing at a rate for exceeding initial predictions a half century ago. There are several reasons, mostly related to the economics including the harvesting of salable peat for fuel and as an additive to organically poor soils for gardening and farming all over the world, and the need for arable farmland and pastures. A board assigned to peat economic management has designated a very small percentage of the bogland for preservation, and even some of that has been disturbed.

The entire magazine is great reading. I wish to thank Phil Sheridan for bringing this issue to my attention. (DES)

FINAL PROTECTION RULING ON *SARRACENIA RUBRA* ssp. *ALABAMENSIS* UNDER UNITED STATES ENDANGERED SPECIES ACT

by Donald Schnell

(Rt. 1, Box 145C, Pulaski, VA 24301, USA)

In the December, 1988 issue of CPN (CPN 17:104), we cited a Federal Register entry proposing the *Sarracenia rubra* ssp. *alabamensis* be listed as endangered.

There were two replies to the federal request for input, one from an individual and one from a conservation organization, both favorable. As a result, the Federal Register (54:10150-10154) of 10 March 1989 has described the subspecies as officially endangered, the status effective 10 April 1989. ICPS members should adjust all of their activities pertaining to the subspecies accordingly.

The original Federal Register article cited in the December, 1988 CPN had a pretty good summary of the subspecies history, ecology, references, causes for endangerment, etc. Much of this material is repeated in the Federal Register entry cited above, with the addition of a brief description of the taxonomic problems and why the Fish and Wildlife Service chose the subspecies nomenclature.

Many of you, as I was, may wonder why *S. rubra* ssp. *alabamensis* received this designation prior to *S. rubra* ssp. *jonesii* which is certainly present in fewer numbers and has received much more publicity over the years. A telephone conversation with Ms. Susan Lawrence of the Fish and Wildlife Service on 29 March 1989 may have shed light on what happened. As a result of recent political decentralization of government, regional divisions of the F & W Service have been given more autonomy in their activities. Since *S. rubra* ssp. *alabamensis* range falls in the Jackson Mississippi region, and *S. rubra* ssp. *jonesii* range is in the Atlanta, Georgia region, the Mississippi office apparently placed their priorities regarding limited finances and other resources differently.

Personally, even though the field work to propose a species as endangered is closer to division offices, I think a central authority should still guide decisions in order to provide cohesiveness, balance and priority in allocation of expensive efforts.

SPECIAL ANNOUNCEMENT

Source List Corrections:

Lee's Botanical Gardens
12731 SW 14th Street
Miami, FL 33184
(305) 223-0496
(The address was omitted)

Burleigh Park Orchid Nurseries
(Australia) No longer stocks C.P.

INTERNATIONAL CARNIVOROUS PLANT SOCIETY SEED BANK

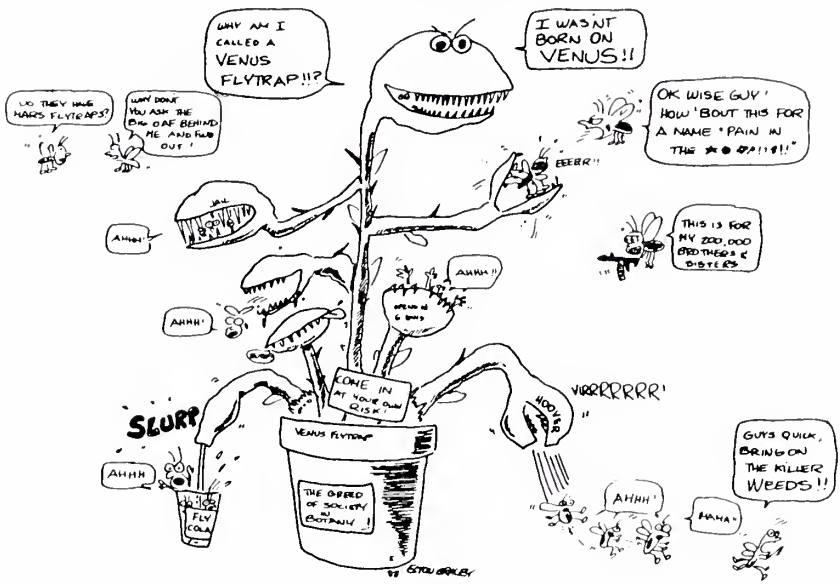
June 29, 1989

Capsella bursa-pastoris (non-CP);
Dionaea muscipula;
Drosera aliciae (10);
D. arcturi (9);
D. binata (14);
D. burkeana (10);
D. burmanni;
D. capensis (narrow leaf);
D. capillaris (11);
D. capillaris (large) (10);
D. collinsae (5);
D. dielsiana (9);
D. erythrorhiza;
D. erythrorhiza squamosa;
D. filiformis filiformis (NJ);
D. x california sunset (4);
D. glanduligera;
D. intermeda;
D. intermedia (S. Carolina);
D. lovellae (5);
D. lowriei (3);
D. pulchella (1);
D. rotundifolia;
D. rotundifolia (Czechoslovakia);
D. rotundifolia (Lowland-Czechoslovakia);
D. stenopetala (3);
D. stolonifera humilis (10);
Drosophyllum lusitanicum (3);
Pinguicula vulgaris (10);
P. vulgaris (Norway);
Sarracenia alata;
S. flava (10);
S. flava (typica);
S. leucophylla;
S. leucophylla "chipoca";
S. oreophiila (6);
S. purpurea purpurea (Maine);
S. purpurea venosa "Louis Burke" (5);
S. rubra (Gulf Coast) (2);
S. rubra gulfensis (5);
S. rubra rubra (9);
S. rubra wherryi;
S. alata x minor (10);
S. flava x purp. x flava x purp. (10);
S. flava x (*alata x flava*) (5);
S. purp. x *psitt.* (3);
Utricularia pentadactyla (10);
U. subulata (1);
U. uliginosa (2)

For updated information on the Seed Bank inventory, please contact Gordon C. Snelling 329½ W. Palm Ave., Monrovia, CA 91016, USA. Please include S.A.S.E. or return postage. Overseas include 2 international reply coupons (IRC's)

TIDBITS

From Elton Bracey


WHY AM I CALLED A VENUS FLYTRAP!!?
I WASN'T BORN ON VENUS!!
DO THEY HAVE HAIRS FLYTRAPS?
WHY DON'T YOU ASK THE BIG OAF BEHIND ME AND FIND OUT!
OK WISE GUY! HOW 'BOUT THIS FOR A NAME "PAIN IN THE ★● @#!!@!!"
EEEEK!!
AHHH!
AHHH!
AHHH!!
THIS IS FOR MY 200,000 BROTHERS & SISTERS
COME IN AT YOUR OWN RISK!
SLURP
VENUS FLYTRAP
VIRRRRRRR!
HOOVER
AHHH
THE CURSE OF SOCIETY GARLIC
AHHH!
HAHA!
GUYS QUICK, BRING ON THE KILLER WEEDS!!

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BOTANICAL GARDEN

Catopsis berteroniana, an insectivorous Bromeliad on the foot of Auyantepui, Venezuela.